

STEELHEAD SURVEYS IN OMAK CREEK

2003 Annual Report

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Executive summary

Redd, snorkel, and canopy cover surveys were conducted in 2003 on Omak Creek, located in north central Washington, within the Columbia Cascade Province, a tributary to the Okanogan River. Redd surveys indicated that adults had returned to Omak creek in 2003 to spawn and 21 redds were observed in the two river miles utilized as reference reaches. Snorkel surveys indicated that steelhead fry were abundant in the Moomaw Reach (RM 2.9 to 4.6) with few fish observed within the Mill reach likely due to a fire retardant kill that occurred earlier this summer. Snorkel surveys indicated good fry recruitment and little or no competition or predation risks from other fish species. Canopy cover increased three fold since 2000 resulting from land management changes and good riparian area recovery. Future surveys will allow for trend analysis of the steelhead population and improvements to riparian corridor conditions that will eventually result in lower summer water temperatures. Preliminary results are promising but long-term monitoring is needed to determine the actual success or failure of strategies implemented to reestablish endangered summer steelhead in Omak Creek. Based upon results, recovery efforts implemented in Omak Creek may be utilized to strengthen anadromous fish populations in other tributaries of the Okanogan River basin.

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Introduction

Omak Creek is located in Okanogan County, Washington, and is wholly contained within the reservation of the Colville Confederated Tribes. The Omak Creek watershed has cultural significance to the twelve Colville Confederated Tribal Bands. Omak Creek is a common cultural-use area for activities such as resource gathering, berry picking, ceremonial sweating, education, picnicking and fishing. Fishing was important in Omak Creek since evidence of fish drying racks and nets were apparent in early photographs. Due to barriers, mid-stream reaches have been inaccessible by anadromous fish and land management practices within the watershed have reduced the quality of fish spawning habitat. Therefore, anadromous stocks have virtually been non-existent in Omak Creek since the early 1900's.

This project is, in part, to strengthen anadromous fish populations, particularly summer steelhead (listed as endangered), in the upper Columbia River Basin. Omak Creek was surveyed in 1992 by personnel of the CCT-Fish and Wildlife Department. The collected information estimated and described the physical condition of the in-stream habitats from the confluence of the Okanogan River upstream 12.2 miles (TFW Ambient Monitoring Stream Segment Summary 1992). The results of the survey indicated the habitat is in marginal condition, with most of the reaches evaluated for spawning habitat being embedded (Hanson 1992). Canopy closure exceeded 50% (57%) at only one of the four reaches surveyed. Consequently, water temperatures have been measured greater than 75°F (lethal for juvenile steelhead) during 1997 and 1998 (CCT, Fish and Wildlife, unpublished data).

Since the mid-1990's the efforts to restore the anadromous fisheries resource, particularly steelhead, in Omak Creek has been extensive and funded through a variety of sources. Actions have included road decommissioning, riparian vegetation planting, removal of fish passage barriers, channel restoration, and construction of fences to reduce impacts caused by livestock. To assess the success of habitat improvements, particularly channel reconfiguration (RM 0.5 to 1.0) and improved bank stability (RM 2.9 to 4.6), as related to steelhead production in Omak Creek, redd, snorkel and canopy closure surveys were conducted during the spring and fall of 2002.

Site selection

Omak Creek is approximately 22 miles long. At RM 5.1 a natural falls impedes fish migration for steelhead and is a complete barrier to spring chinook salmon. To ensure consistent comparisons and trends of redd and fry abundance across years, which could be influenced by accessibility at and above the falls (i.e. flow conditions would change passage conditions), surveys were conducted downstream of the falls. Redd and snorkel surveys were conducted in two reaches (RM 0.5 to 1.0; RM 2.9 to RM 4.6). The lowermost reach is where extensive channel modification (floodplain creation, removal

of ~ 60,000 cubic yards of material, etc.) has occurred during the fall and winter of 2002/03. The upstream reach lies within Tribal Trust property and also where in-stream structures have been installed to improve bank stability, reduce the accelerated erosion, decrease the amount of fine sediment delivered to the stream channel, and reestablish riparian vegetation.

On July 20, 2003 a wild fire located near Mission Falls occurred burning 459 acres and fire retardant was dropped into Omak Creek at RM 5.5. A complete investigation of fish killed identified approximately 9,053 juveniles were killed. A complete fish kill occurred in the lower section of Omak Creek (RM 0-1.0) with a particle kill occurring upstream. A complete investigation on the impact to Omak Creek steelhead was prepared by Colville Tribe and Entrix, Inc. fish biologists (Fisher et al. 2003). Impacts from the August 2001 wild land fire that burned 8,112 acres (~9%) within Omak Creek Watershed are still affecting results. During the 2001 fire suppression activities, an inadvertent aerial drop of fire retardant completely killed fish from RM 8.0 to 2.9 partial kill fish RM 2.9 to the mouth.

Methods

A redd surveys was conducted on foot on May 26, 2003. Redd survey was conducted moving upstream. Physical habitat was recorded if observed within 1 meter of the redd's edge. Physical habitat categories include: none, large wood debris (LWD minimum = 3 in. diameter, 6 ft. long), canopy, and overhanging stream bank. A Global Position System (GPS) recorder was used to assess the spatial distribution of redds within the sample reaches.

Snorkel surveys were conducted by three CCT- Fish and Wildlife biologists during October 3, 2003 (Figure 1). Snorkel surveys were conducted in an upstream direction by one snorkeler per reach (Thurow 1994). Snorkel survey reaches were 100 m in length. Each sample reach was separated by 100 m. From ~ RM 0.5 to 1.0 (beginning on the upstream side of HWY 155 bridge), a total of 500-m was snorkeled within a 1000 m reach. From ~ RM 2.9 to 4.6, within two 1000 m reaches a total of, 1000 m were snorkeled.

All fish species were recorded with the exception of suckers and sculpin, which were identified to genus. Steelhead observed were further divided into length categories of < 100 mm and > 100 mm.

Canopy closure was estimated by walking the stream from river mile 2.9 to 4.6 and using a convex densitometer (Platt's 1983). Data was collected at 20-transects and readings were taken at 4 locations along each transect. The 4 location values were averaged to determine canopy closer at each transect and all transects were averaged to get a comparative value for data collected during 2000.

Adult enumeration counts were attempted at a picket weir site located at RM 0.1. The picket weir trap consisted of five 3-foot wide tripods that were filled with pickets and one trap with a funnel gate that measured 8' long x 4' wide x 4' deep. The trap was anchored by chain to a log that spanned the entire creek upstream of the trap location. The trap was checked for fish twice daily when in operation.



Figure 1. Snorkel survey conducted on Omak Creek, October 3, 2003.

Results

Adult enumeration at the Picket weir site occurred from March 15, 2003 to April 23, 2003. Nine adult fish were collected along with 2 out-migrating steelhead smolts and 3 out-migration spring Chinook smolts (Table 3). The picket weir trap was problematic at flows over approximately 80 cfs the weir would wash out and it was difficult to rebuild until flows were below 50 cfs. Fish were collected most commonly on the ascending limb of the hydrograph but it is unknown how many fish went upstream during high flows when the weir was disabled.

The density of steelhead redds located in the upper reach (21 redds) was substantially greater than in the lower reach (0 redds). Prior to the redd survey in the lower reach 8 steelhead were observed after being collected at a trap site located just upstream of the mouth. Several steelhead were seen prior to the redd survey in the upper reach. Of the 21 redds, 11 were associated with canopy cover, 1 with large wood, 3 with undercut bank, 1 with boulders and 2 with a combination of physical habitat parameters (1 canopy cover and undercut bank; 1 LWD and canopy cover). The remaining 8 redds were not associated with any physical habitat as described by this survey. Due to corrupted files GPS data that identified location of Redds was not retrievable.

The snorkel survey was conducted October 3rd at 9:00am in the morning, skies were clear and the water temperature was 55° F. Snorkel surveys indicated *Oncorhynchus mykiss* was the most abundant species in both stream reaches (Table 1). *Oncorhynchus mykiss* fry density was greater in the lower segment of the Moomaw reach at an average of 2-fish/meter with an overall average for the Moomaw reach of 1.8 fish/meter. These values are lower than the density of 2.14 fish/meter observed in 2002 in this same reach. The mill site reach had few steelhead observed with densities of 0.02 fish/meter and this was considerably less than the 0.5 fish/meter in 2002. For the second straight year species richness was greater with 3 species observed in the lower reach compared to just 2 species observed in the upper reach. Species richness was similar to 2002 in the upper reach but lower than the 7 species observed in 2002.

Canopy closure estimates were collected from July 16 to July 18, 2003. The estimates of canopy closure for the upper reach (river mile 2.9-4.6) transects ranged from 0% to 72.1%. The average canopy closure for the upper reach in 2003 was 31.0% compared to a 10.3% estimate when data was collected in 2000 (Table 2). Differences in transect from 2002 to 2003 was largely the result of in-stream habitat improvements made during fall of 2002 that resulted in reduced canopy closer in some transects but overall canopy cover increased slightly.

Adult enumeration at the Picket weir site occurred from March 15, 2003 to April 23, 2003. Nine adult fish were collected along with 2 out-migrating steelhead smolts and 3 out-migration spring Chinook smolts (Table 3). The picket weir trap was problematic at flows over approximately 80 cfs the weir would wash out and it was difficult to rebuild until flows were below 50 cfs. Fish were collected most commonly on the ascending limb of the hydrograph but it is unknown how many fish went upstream during high flows when the weir was disabled.

Table 1. Number of fish observed during snorkel surveys by species and stream reach for Omak Creek during October of 2003.

		Number Observed												
Location	Reach	Length (m)	RBT <100mm	RBT >100mm	Whitefish	SMB	Chinook	EBT	Sculpin	Sucker	Unidentified fish	RBT Density (Fish/m)	Snorkelers initials	
Mill	0-100	100	0	0	0	0	0	0	0	0	1	0	JA	
Mill	200-300	100	0	0	0	2	0	0	0	0	2	0	CF	
Mill	400-500	100	0	0	0	0	0	0	0	0	0	0	JM	
Mill	600-700	100	5	1	1	2	0	0	0	0	0	0.06	JM	
Mill	800-900	100	3	1	1	2	0	0	0	0	0	0.04	JA	
Lower Reach Average			1.6	0.4	0.4	1.2	0	0	0	0	0.6	0.02		
Moomaw	0-100	100	240	30	0	0	0	0	0	0	0	2.7	JA	
Moomaw	200-300	100	156	17	0	0	0	0	0	1	0	1.73	CF	
Moomaw	400-500	100	148	1	0	0	0	0	0	0	0	1.49	JM	
Moomaw	600-700	100	175	13	0	0	0	0	0	0	1	1.88	JM	
Moomaw	800-900	100	194	20	0	0	0	0	0	0	4	2.14	CF	
Lower Moomaw Average			182.60	16.20	0.00	0.00	0.00	0.00	0.00	0.20	1.00	1.99		
Moomaw	1000-1100	100	134	5	0	0	0	0	0	0	0	1.39	JA	

Moomaw 1200-1300	100	213	10	0	0	0	0	0	0	0	0	2.23	JM
Moomaw 1400-1500	100	128	17	0	0	0	0	0	0	2	1	1.45	CF
Moomaw 1600-1700	100	83	5	0	0	0	0	0	0	0	0	0.88	JA
Moomaw 1800-1900	100	130	17	0	0	0	0	0	0	0	1	1.47	JM
Upper Moomaw Average		137.60	10.80	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.40	1.48	
Moomaw Reach Average		162.15	13.75	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.73	1.76	
Total Fish Mill Reach		8	2	2	6	0	0	0	0	0	3		
Total Fish Moomaw Reach		1601	135	0	0	0	0	0	0	3	7		

Rainbow trout/ Steelhead = RBT

Smallmouth bass = SMB

Eastern brook trout = EBT

Table 2. Comparison of transect data collected from 2000, 2002 and 2003 for estimated canopy closure form river mile 2.9-4.6 of Omak Creek.

Transect Number	2000 Canopy Closure Estimate (%)	2002 Canopy Closure Estimate (%)	2003 Canopy Closure Estimate (%)
1	0	0	29.4
2		5.9	17.6
3		0	0
4	10.3	48.5	10.3
5		0	0
6		42.6	10.3
7		14.7	10.3
8	33.8	66.2	60.3
9		82.4	60.3
10		8.8	23.5
11	7.4	8.8	17.6
12		4.4	36.8
13		1.5	32.4
14		51.5	48.5
15	7.4	42.6	39.7
16		75	54.4
17		73.5	72.1
18	2.9	17.6	25
19		7.4	30.9
20		51.5	39.7
Average	10.3	29.6	31.0

Table 3. Data collected from picket weir trap located at RM 0.1 on Omak Creek during the spring of 2003.

Date	Time	Location	Method	M/F	H/W	Tag	Temp (°F)	Flow (CFS)	Comments
3/15/03	8:00	Omak Creek	Picket weir	M	W			63.2	1 Fish

3/16/03		Omak Creek	Picket weir					88.6	Washed out
3/19/03		Omak Creek	Picket weir					50.4	Re-installed
3/20/03	8:00	Omak Creek	Picket weir					63.7	0 fish
3/21/03	8:00	Omak Creek	Picket weir				41crk 44riv	54.4	0 fish
3/22/03	8:30	Omak Creek	Picket weir	F	H		43crk 44riv	68.0	1 dead fish
3/23/03	9:00	Omak Creek	Picket weir					80.1	0 fish
3/24/03	7:30	Omak Creek	Picket weir					64.4	0 fish
3/25/03	8:00	Omak Creek	Picket weir				38crk 38riv	58.6	0 fish
3/26/03	8:00	Omak Creek	Picket weir					56.8	0 fish
3/27/03	8:00	Omak Creek	Picket weir				36crk 39riv	52.9	0 fish
3/28/03		Omak Creek	Picket weir				36crk 40riv	49.7	0 fish
3/29/03		Omak Creek	Picket weir				40crk	49.7	0 fish
3/30/03		Omak Creek	Picket weir				42crk 44riv	54.2	Lost 1 fish
3/31/03	8:30	Omak Creek	Picket weir	F	H	Hole in upper tail	44crk	85.7	1 fish
4/01/03	8:30	Omak Creek	Picket weir	M	H	R-Pect	40crk 41riv	84.9	1 fish
4/01/03	8:30	Omak Creek	Picket weir	F	W	R-Pect	40crk 41riv	84.9	1 fish
4/02/03	8:00	Omak Creek	Picket weir				41crk 44riv	70.4	0 fish
4/03/03	8:30	Omak Creek	Picket weir				38crk 39riv	61.5	0 fish
4/04/03	8:00	Omak Creek	Picket weir				37crk 47riv	56.2	0 Fish
4/05/03	8:00	Omak Creek	Picket weir				38crk 45riv	52.6	0 Fish
4/06/03	9:00	Omak Creek	Picket weir				39crk 44riv	50.4	0 Fish
4/07/03	8:21	Omak Creek	Picket weir				40crk 45riv	49.1	0 fish

4/08/03	8:25	Omak Creek	Picket weir				43crk 47riv	48.7	0 Fish
4/09/03	8:30	Omak Creek	Picket weir				47crk 50riv	54.7	0 Fish
4/11/03	8:00	Omak Creek	Picket weir	F			44crk 49riv	60.9	1 Fish-small fish
4/11/03	8:00	Omak Creek	Picket weir	M	H		44crk 49riv	60.9	1 Fish-small fish
4/11/03	5:30	Omak Creek	Picket weir	M	H		49crk	60.9	1 Fish
4/12/03	8:00	Omak Creek	Picket weir				43crk	68.2	0 Fish
4/13/03	9:00	Omak Creek	Picket weir				43crk	91.6	0 Fish
4/13/03	4:00	Omak Creek	Picket weir				48crk	91.6	0 Fish
4/14/03									Picket weir washed out
4/18/03	2:00							103	Picket weir reinstalled
4/19/03	9:30	Omak Creek	Picket weir				41crk	97.1	2 steelhead smolts
4/20/03	9:00	Omak Creek	Picket weir				43crk	95.7	0 Fish
4/20/03	4:30	Omak Creek	Picket weir				48crk	95.7	1 tripod out
4/21/03	8:15	Omak Creek	Picket weir				45crk	101	2 Chinook smolts
4/22/03	8:00	Omak Creek	Picket weir				46crk	108	1 Chinook smolt
4/23/03	7:54	Omak Creek	Picket weir				48crk	116	Tripod slip

Discussion

Adult enumeration results did not provide much data due to difficulties in keeping the weir in during flows exceeding 80 cfs. However, these data do confirm adult returns to Omak Creek. Two thirds of the fish collected were of hatchery-origin but the total contribution to adult spawners remains unknown. Prior to the spring of 2004 modifications (tripod design) will be made to the trap to improve its effectiveness during increased flows.

Redd surveys are a common method used to monitor and evaluate adult steelhead returns and to determine population level trends. To do trend analysis a baseline of data is needed to be collected, but these data need to be established over several consistent years. Due to large fish kills from fire retardant drops in both 2001 and 2003 the consistency has

not been established. Data comparison from 2003 to 2002 indicates lower juvenile steelhead densities. Three main reasons for this are; 1) 2003 fire retardant fish kill, 2) fewer adult steelhead spawners (based upon reduced number of steelhead redds within reference reach), and 3) difference in spatial distribution of juvenile steelhead due to habitat improvements completed during December 2002 and January 2003.

Approximately 25,000 steelhead smolts were out-planted into Omak Creek during the spring of 2003. One location of out-plants has been on North Omak Lake road (~RM 4.6). Approximately 5,000 of these fish were larger than 5 fish per pound and were therefore more likely to residualize than fish stocked at smaller sizes. During the evaluation of the fish kill and snorkel observations several large fin-clipped steelhead were observed. It is assumed these fish were a result of this stocking effort. These fish probably increased observed densities to some unknown degree within the reference reach and may artificially skew results.

Spatial distribution of redds and fry densities were similar to surveys conducted during 2002. Such that the greatest densities existed in the middle reach (i.e. the lower Moomaw) and lowest in the lowermost reach. This distribution may be due to a substantial change in stream gradient (~ 1 % upper reach, 2.8% in the lower reach).

Species richness was higher in the lower reach probably because of the close proximity to the Okanogan River. The Okanogan River is known to have populations of predatory species such as smallmouth bass observed during snorkeling surveys. These species are probably transitory and not residents of Omak Creek. The abundance of redds indicates that passage and spawning of wild fish is occurring and the dominance of juvenile steelhead shows that Omak Creek has considerable potential for natural production with minimal competition or predation.

Stream rehabilitation projects along Omak Creek are producing results. Canopy cover has increased three fold in the upper reach of Omak Creek since 2000. The increase in canopy should reduce warm water temperatures in the lower reach. Most of this increase is the result of reduced grazing pressures along the riparian corridor and recovery of grass and shrub communities that remained. Additional plantings have been made in areas that were heavily impacted by years of poor land use practices. However, in-stream work conducted in the fall of 2002 reduced canopy cover in some transects but it is believed that these areas will recover rapidly. It will take several years of collecting data over specific transects before measured benefits of these rehabilitation activities can be determined. Preliminary results indicate that recovery of endangered summer steelhead in Omak Creek is underway and similar rehabilitation efforts should be considered throughout the upper Columbia.

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collection of adult steelhead to initiate the development of a locally-adapted broodstock for Omak Creek.

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